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MOSSES OF CALIFORNIA VI. HALL NATURAL AREA AND MONO COUNTY

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On the eastern slope of the Sierra Nevada, about five miles north of Tioga Pass and bordering Yosemite National Park, California, is the Harvey Monroe Hall Natural Area, the scene of the historic transplant experiments initiated by Dr. Hall and continued by J. Clausen, D. D. Keck, and W. M. Hiesey under the auspices of the Carnegie Institution of Washington. During the last decade, the writer has studied the collections of mosses made in this area by Dr. D. G. Catcheside in 1947 and by Dr. E. H. Ketchledge in 1953. I am indebted to Dr. Catcheside for placing his collection at my disposal, and to Dr. W. M. Hiesey for the loan of Dr. Ketchledge's collections. Dr. Malcolm A. Nobs of the Carnegie Institution at Stanford has been especially helpful in providing general information about the Natural Area and details of its topography and flora. Both Dr. Catcheside and Dr. Ketchledge kindly provided additional information and data about their collections.

The Harvey Monroe Hall Natural Area is part of the Toiyabe National Forest and includes approximately nine square miles, of which Mount Conness is the highest point at 12,556 feet above sea level. The area is severely glaciated and dissected by three hanging valleys which radiate in an easterly direction from the Sierran crest. The floors of these valleys are typically U-shaped, and alternate between alpine meadows and dry terminal moraines. According to Dr. Nobs, the habitats there are diverse, ranging from alpine bogs to places which are nearly desert-like and inhabited by sage-brush. *Pinus murrayana* Balf. and *P. albicaulis* Engelm. are dominant, the first at lower altitudes and on slopes with a southern exposure, and the second at higher altitudes and on slopes with northern exposure. Tree line is about 11,500 feet above sea level, and the alpine turf above it includes the caespitose *Salix petrophila* Rydb. as well as many "cushion plants." From the information available at the Carnegie Institution at Stanford, the vascular plants of the area include more than 330 species, of which 10 are pteridophytes and 6 are gymnosperms.

In this area, Dr. Catcheside and Dr. Ketchledge collected a total of 58 species of mosses, of which 5 appear to be the first authentic records from California: *Blindia acuta*, *Bryum muehlenbeckii*, *B. pallens*, *Campylium stellatum*, and *Mnium orthorrhynchum*. Dr. Howard A. Crum identified

one of the specimens as *Ceratodon purpureus* var. *dimorphus*, another addition to the known moss taxa of California. The specimens of *Bryum* and *Mnium* were named by Dr. A. L. Andrews, and Dr. H. S. Conard verified the identity of *Campylium stellatum*.

The earliest collections of mosses known to me from Mono County are of *Cratoneuron filicinum* and *Oncophorus virens*. These were collected by H. N. Bolander between 1860 and 1864 when he was associated with the California State Geological Survey, and are probably the specimens reported from Mono Pass by Leo Lesquereux (1868). Most later collections in Mono County, other than those of Catcheside and Ketchledge, were obtained from Leevining Grade below Tioga Pass, where the author found specimens representing 17 taxa in 1947.

As a unit, these collections are especially interesting because, in addition to being the only ones known from the Hall Natural Area, they are the first adequate sample of the moss flora of the eastern escarpment of the Sierra Nevada in California. When these species are classified according to their world-wide distribution in my previously published system (Koch, 1954, p. 522), the data are as follows:

Distributional division	Number of species		Percentage of species	
	California	Mono Co.	California	Mono Co.
A. Represented in both hemispheres of the earth:				
1. Weedy	3	none	0.9	none
2. Cold to temperate	56	22	17.7	30.6
3. Temperate to subtropical	17	4	5.4	5.5
B. Restricted to the northern hemisphere:				
4. Anomalous	4	none	1.3	none
5. Three Boreal Continents	100	27	31.7	37.5
6. Europe-North America	39	8	12.3	11.1
7. Asia-North America	5	none	1.6	none
8. Restricted to North America	93	11	29.3	15.3
Totals	317	72	100.2	100.0

The data show a significantly lower percentage of mosses known from Mono County, when compared to the entire state of California, whose distribution is limited to North America; contrariwise, there is a significantly higher percentage of Mono County mosses whose distribution extends from colder to temperate regions in both hemispheres and into all three of the boreal continents, but not into the austral hemisphere. Only two of the mosses known from Mono County are endemic to California, which is less than half of the percentage of mosses endemic to California in its entirety. Also of interest is the absence of all representatives of the Asia-North America division from the Mono County flora.

In the following catalogue of the species of mosses known to be part of the flora of Mono County, California, the names of Catcheside and Ketchledge are abbreviated to C. and K., respectively. The specimens collected

by Dr. Catcheside are represented in his personal herbarium at the University of Birmingham, and duplicates of many of them are in the Herbarium of the University of Michigan or of the author. All of Dr. Ketchledge's collections are represented in the Herbarium of the Carnegie Institution of Washington at Stanford, California.

DITRICHACEAE

CERATODON PURPUREUS (H.) Brid. *K.* 1993; var. DIMORPHUS (Phil.) C. Jens. *C.* 4774. The varietal form is diminutive and grows in minute cushions which at first glance do not resemble typical specimens of the species. According to Dr. H. A. Crum, who identified this specimen, the variety has also been found in North America by Macoun at Lake Agnes above Lake Louise in Alberta, Canada, although not mentioned by Grout (1928-40).

DISTICHIMUM CAPILLACEUM (H.) B. S. G. *K.* 1918; *Koch 1780i* (UM), Leevining.

SELIGERACEAE

BLINDIA ACUTA (H.) B. S. G. *K.* 1935, 1984.

DICRANACEAE

ONCOPHORUS VIRENS Brid. *Bolander* (NY), Mono Pass (Lesq. 1868); *C.* 4790, 4797; *K.* 1904, 1981.

POTTIACEAE

DESMATODON LATIFOLIUS var. MUTICUS Brid. *C.* 4784, 4786; *K.* 1907, 1927, 1946.

TORTULA PRINCEPS de Not. *C.* 4756.

WEISSIA CONTROVERSA H. *K.* 1911, 1912.

GRIMMIACEAE

GRIMMIA AGASSIZII (Sull.) Lesq. & James. *C.* 47105, fide Sayre.

G. ANODON B. S. G. *Alexander* (UC 719364), Hot Spring formation 2 miles southeast of Bridgeport.

G. BREVIROSTRIS Will. *C.* 4783.

G. HAMULOSA Lesq. *C.* 47143, 47144, 47145.

G. MONTANA B. S. G. *C.* 4782.

RHACOMITRIUM HETEROSTICHUM (H.) Brid. *C.* 47146; *K.* 1939.

SCOULERIA AQUATICA Hook. *Koch 1769* (UM), Leevining.

BRYACEAE

BRYUM ALPINUM With. *C.* 47101.

B. ANGUSTIRETE Kindb. *Hall.* (CAS 221858), Leevining; *C.* 47148.

B. FLAGELLOSUM Kindb. *C.* 47129; *Koch 1773* (UM), Leevining.

B. MUEHLENBECKII B. S. G. *C.* 4775, on wet rocks above cabin, altitude 10,200 feet. Previously reported by Andrews (1940) "from the northern United States (Maine, New Hampshire, northern Michigan, Idaho) northward into British America; . . . also in Europe and Asia."

B. PALLENS (Brid.) Röhl. *K.* 1959, at Ravine Creek, altitude about 10,600 feet. Its previously known distribution, according to Andrews

(1940) was "In wet places, from the far north, southward across the continent to northern New England, New York, Montana, Washington; also in Europe and Asia."

B. PALLESCENS Schwaegr. *Koch 2211* (UM), near Bridgeport.

B. STENOTRICHUM K. Müll. *C. 4787*.

B. TURBINATUM (H.) Smith. *Alexander* (UC 719377), along Deep Creek; *C. 47125*; *Koch 1772* (UM), Leevining.

B. WEIGELII Spreng. *C. 47112, 47126*.

LEPTOBRYUM PYRIFORME (H.) Schimp. *Cantelow* (LFK x105), near Bridgeport (CAS); *Hall 502* (CAS 221851; UC), Leevining; *Koch 1774* (UM), Leevining; *C. 47158*.

MNIOBRYUM WAHLENBERGII (W. & M.) Jenn. *C. 4779, 47114, 47115*.

POHLIA CAMPTOTRACHELA R. & C. *R. R. Koch* (LFK 2211), Barney Lake, (UM).

POHLIA CRUDA (H.) Lindb. *C. 4792, 4798, 47147, 47159*, the latter two from Leevining.

POHLIA OBTUSIFOLIA (Brid.) Koch. *C. 47122*, Middle Ridge near Spiller Lake, altitude at about 10,400 feet. Andrews (1940) used the name *P. cucullata* (Schwaegr.) Bruch. It has been reported from California only twice before (Koch 1950). Both reports are based on Bolander's collection from Mount Dana.

P. DRUMMONDII (C.M.) Andr. *C. 47117*.

MNIACEAE

MNIUM MARGINATUM (With.) P. B. *Koch 1766* (UM), Leevining.

M. MEDIUM B. S. G. *Koch 1775, 1767* (UM), Leevining.

M. ORTHORHYNCHUM Brid. *K. 1917, 1920*, above Alpine Lake, altitude about 11,300 feet. Andrews (1940) described it as "widely distributed through the 3 northern continents; in North America noted from Alaska and Yukon south to New Mexico, in the eastern states to North Carolina."

M. PUNCTATUM H. *Koch 1768* (UM), Leevining.

AULACOMNIACEAE

AULACOMNIUM PALUSTRE (H.) Schwaegr. *C. 4793, 47111*; *K. 1929, 2001*.

BARTRAMIACEAE

BARTRAMIA ITHYPHYLLA Brid. *C. 47136*; *K. 1930, 2003, 2012*.

PHILONOTIS AMERICANA Dism. *C. 4794, 4795, 4799*; *Hall 503* (NY), Leevining; *R. R. Koch* (LFK 2209), Barney Lake, (UM).

P. FONTANA (H.) Brid. *C. 4778, 47102, 47104, 47106, 47124, 47131*; *K. 1908, 1935B, 1950, 1956*; *Koch 1779* (UM), Leevining; var. *PUMILA* (Turn.) Brid. *K. 1975*. The abundance of this moss undoubtedly reflects the absence here of the various species of *Sphagnum* which inhabit similar habitats in more northern latitudes.

ORTHOTRICHACEAE

AMPHIDIUM LAPONNICUM (H.) Schimp. *K. 1982b, 1998*.

ORTHOTRICHUM LAEVIGATUM Zett. *K. 1919, 1921*.

- O. LYELLII var. PAPILLOSUM (Hampe) Lesq. & James. *C.* 474, 4757.
 O. RUPESTRE (Brid.) Schwaegr. *C.* 47158.

FONTINALACEAE

- FONTINALIS ANTIPYRETICA H. *C.* 4759, 4760.

CRYPHAEACEAE

- DENDROALSIA ABIETINA (Hook.) Britt. *C.* 47121.

LEUCODONTACEAE

- ANTITRICHIA CALIFORNICA (Hook. & Arn.) Sull. *K.* 1901.

LESKEACEAE

- PSEUDOLESKEA PATENS (Lindb.) Limpr. *K.* 1953, 1997.

AMBLYSTEGIACEAE

AMBLYSTEGIUM SERPENS (H.) Schimp. *Koch 1770* (UM) Leevining.

CALLIERGON STRAMINEUM (Brid.) Kindb. *K.* 1999, on eastern side of ridge between Big Horn Lake and East Pond, altitude about 11,100 feet. Previous records of this moss from California (Koch, 1949) were based on fragments gleaned from specimens of other taxa.

CAMPYLIIUM STELLATUM (H.) Lange & C. Jens. *K.* 1990, at source of Cabin Creek, altitude about 10,350 feet. Although widely distributed in the boreal hemisphere, apparently the species has not been found in the Pacific Coast states before. Grout (1928–40) reported it as in "Northern U. S. and Canada; ranging west to the Rocky Mts., Colorado, British Columbia and Alaska; south to Pennsylvania and Ohio in the East."

CRATONEURON FILICINUM (H.) Roth. *Bolander* (NY), from Mono Pass (Lesq. 1868).

DREPANOCCLUS EXANNULATUS (Gümb.) Warnst. *C.* 47141; *K.* 2004.

D. FLUITANS (H.) Warnst. *K.* 1966, 1967.

D. UNCINATUS (H.) Warnst. *C.* 4791, 47100, 47133; *K.* 1905, 1926, 1994, 2005, 2008; *Koch 1765* (UM), Leevining.

HYGROHYPNUM LURIDUM (H.) Jenn. *C.* 47128.

H. MOLLE (Schimp.) Loeske *C.* 47138; *K.* 1996, 2010.

H. OCHRACEUM (Wils.) Loeske *C.* 47118, 47119, 47120, 47127, 47153, the last from Leevining; *K.* 1969, 1976, 1977, 1978; *Koch 1776* (UM) Leevining.

H. SMITHII (Lilj.) Broth. *C.* 4788.

LEPTODICTYUM RIPARIUM (H.) Warnst. *K.* 1970.

L. TRICHOPODIUM (Schultz) Warnst. *K.* 1963. According to Dr. Conard, this specimen is a variant of the species rather distinct from the following variety which is widely distributed elsewhere in California but not at high altitudes: var. KOCHII (B. S. G.) Broth. *C.* 47156, 47157; *Koch 1771* (UM), all from Leevining. This variety has not been found in the Natural Area.

BRACHYTHECIACEAE

BRACHYTHECIUM ALBICANS subsp. OCCIDENTALE (R. & C.) Perss. C. 47108.

B. ASPERRIMUM Mitt. C. 47140, 47149, 47151; Koch 1743 (UM), the latter three from Leevining.

B. COLLINUM Schimp. K. 1906, 1936.

B. LAMPROCHRYSEUM C. M. & Kindb. Koch 1778 (UM), Leevining.

EURHYNCHIUM STOKESII (Smith) Schimp. Koch 1780 (UM), Leevining.

E. SUBSTRIGOSUM Mac. K. 1987; 1995.

HOMALOTHECIUM NEVADENSE (Lesq.) R. & C. C. 47134.

SCLEROPODIUM OBTUSIFOLIUM (Hook. & Wils.) Kindb. C. 47150, 47154; 47155, Leevining.

S. TOURRETII (Brid.) Koch. Koch 1764 (UM), Leevining.

HYPNACEAE

HYPNUM REVOLUTUM (Mitt.) Lindb. K. 1922, near Alpine Lake, altitude about 10,350 feet. Although Grout (1928-40) included California as being in the range of this species, the Ketchledge collection is the first I have seen (cf. Koch 1950).

POLYTRICHACEAE

POGONATUM ALPINUM (H.) Röhl. K. 2007, 2009.

POLYTRICHADELPHUS LYALLII Mitt. C. 47109, 47110; Baker 9128 (UM), near Lake Mamie; Lewis (LA), Saddlebag Lake.

POLYTRICHUM JUNIPERINUM H. C. 4781, 47130; K. 1943; R. R. Koch (LFK 2210), Barney Lake, (UM).

P. PILIFERUM H. C. 4777, 4780, 47130; K. 1943.

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